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ABSTRACT:

CHG DATE=19990617 STATUS=O> A heat exchanger core (16) is mounted in portions (12,12a) of a supporting frame. Complementary locaters (32,34) are provided to locate the cord (16) angularly in the frame (12,12a). Resilient sealing pads (54,56), seal the frame (12,12a) to the core (16), accommodate the locaters (32,34) and damp vibration between the frame (12,12a) and core (16).

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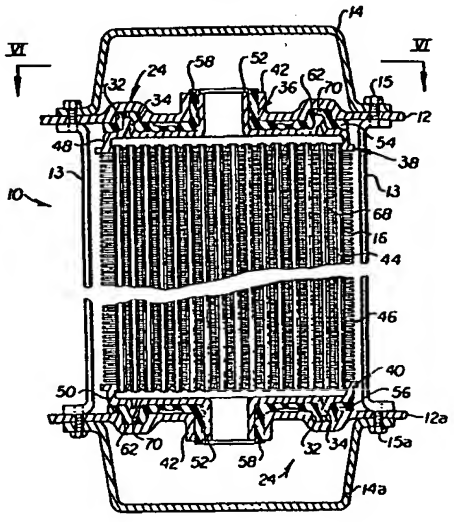
(54) **Heat exchanger assembly.**

(57) A heat exchanger core (16) is mounted in portions (12,12a) of a supporting frame. Complementary locaters (32,34) are provided to locate the core (16) angularly in the frame (12,12a). Resilient sealing pads (54,56), seal the frame (12,12a) to the core (16), accommodate the locaters (32,34) and damp vibration between the frame (12,12a) and core (16).

FIG.1.



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HEAT EXCHANGER ASSEMBLY

This invention relates to heat exchanger assemblies incorporating a frame which supports one or more cores.

Heat exchangers and radiators, and particularly the type of radiators used to cool internal combustion engines, either on a moving vehicle or on a fixed stationary frame, have usually been constructed as single integral units. Such heat exchangers and radiators have also been constructed by mounting a plurality of cooling cores between a pair of spaced inlet and outlet tanks or by connecting the cooling cores together by hoses. These cooling cores include tubes having fins radiating orthogonally therefrom and provide a means for conducting a fluid coolant from the circulating system of the engine so that it flows from the inlet tank, through the tubes, and into the outlet tank. Air flow, often created by a fan or movement of the vehicle, passes through the radiator to absorb heat from the radiating fins thereby reducing the temperature of the fluid coolant flowing through the tubes.

The heat absorbing air flow often carries debris which clogs and damages the cores. Various attempts have been made to avoid such clogging and damage including arranging multiple core modules angularly in a core mounting frame with respect to air flow in slotted "V" shaped pairs so that the debris is deflected

from one of the core faces and directed through the slots. These cores are rotated after a period of use to expose an unclogged core face to the debris laden air flow.

One limitation is that it is costly and time consuming to locate the cores at the proper angular relationship in the first instance and then to locate them again when the cores are rotated. Thus there is a need for a suitable locating means which provides both initial location and rotated location. Previously, the core modules and the inlet/outlet tanks were connected by two fluid coolant carrying tubes at each end of the module. Connection of the tubes provided the desired angular relationship of the module to the air flow. However, these multiple tube connections increased the possibility of leakage of the coolant.

Recognising that vehicle frames vibrate and distort during operation, the radiator cores have in the past been resiliently mounted in some manner to prevent rupture and leakage of the radiator cores which might otherwise occur if the cores were rigidly attached to the frame or to the manifold. A resilient mounting seal has been provided to limit vibration and seal against leakage. However, it has been difficult to provide a suitable resilient mounting seal which could accommodate the locating means and provide a beneficial seal between the core and the multiple tube connections.

In accordance with the invention, a heat exchanger assembly comprises a pair of frame members each having an aperture therein; and a core extending between the frame members and having opposed end portions and a spout extending outwardly from each end portion and into the aperture of a respective one of the frame members; characterised by complementary locating means on one of the end portions and on the respective frame members for locating the core in a predetermined registration with

the frame members; and resilient means resiliently supporting the core between, and sealing the core to, the frame members; the resilient means including a resilient pad positioned between the one end portion and the respective frame member and having a portion resiliently interposed between the complementary means.

The complementary locating means are preferably duplicated on opposite sides of the spout on the one end portion and on the respective frame member whereby the core may be located in registration with the frame in two positions between which it is notionally rotated through 180° about the axis of the spout.

An example of an assembly constructed in accordance with the invention is illustrated in the accompanying drawings, in which:-

Figure 1 is a vertical section through one of a plurality of radiator core modules and taken on the lines I-I in Figure 6;

Figure 2 is an isometric view illustrating a portion of a core module having a pair of locating protuberances;

Figure 3 is a plan illustrating a resilient pad;

Figure 4 is a side elevation of the pad in partial section on the line IV-IV in Figure 3;

Figure 5 is a side elevation as seen from the line V-V in Figure 2; and,

Figure 6 is a plan showing the angular relationship of adjacent core modules of the assembly as seen from the line VI-VI in Figure 1.

~~Best Mode for Carrying Out the Invention~~

A heat exchanger core mounting apparatus is designated 10, Figure 1, and comprises a core supporting frame which includes a pair of spaced apart inlet and outlet header plates 12,12a. A main inlet tank 14 is secured to adjacent inlet plate 12 by bolts 15 and a main outlet tank 14a is secured to adjacent outlet plate 12a by bolts 15a. A plurality of core modules, including but not limited to 16,16a,16b, are mounted between plates 12,12a and are located in angular relationship with respect to an air flow as indicated by an arrow designated 18, see also Figure 6. Thus, air flow passes across an upstream side 20 of plates 12,12a, through core modules 16,16a,16b and across a downstream side 22 of plates 12,12a.

Means 24 are provided for locating core modules 16,16a,16b in predetermined registration with plates 12,12a. By predetermined registration is meant that core modules are located generally in "V" shaped pairs (Fig. 6) so that one edge 26 of each core 16,16a, 16b is adjacent upstream side 20 of plates 12,12a and another edge 28 of each core 16 is adjacent downstream side 22. The upstream edges 26 of adjacent cores are in close enough proximity to resist flow therebetween. However, the downstream edges of adjacent cores are in close proximity to permit air flow therebetween in such a manner that a slot 30 is formed of a sufficient size to permit the passage of debris therethrough. The means 24 for locating preferably includes first and second locating members such as detents 32 formed in plates 12,12a and corresponding protuberances 34 formed on each core 16.

Means 36 are provided for sealingly and resiliently mounting each core 16,16a,16b with plates 12,12a. One of such means 36 is between an inlet end 38 of core 16 and inlet plate 12 and another of such

means 36 is between an outlet end 40 of core 16 and outlet plate 12a in a manner so as to accommodate locating means 24.

Plates 12,12a, Figures 1 and 6, ~~are generally well known and, in accordance with this invention, plates 12,12a~~ include apertures 42 and also include the plurality of first locating members or detents 32 adjacent upstream side 20 and adjacent downstream side 22. A plurality of connector bars 13, which do not inhibit air flow, may be used to interconnect plates 12,12a.

Cores 16,16a,16b ~~are also generally known and, in accordance with this invention,~~ include a plurality of tubes 44 having a plurality of very closely spaced cooling fins 46 radiating orthogonally therefrom. A core inlet tank 48, see also Figures 2 and 5, is at inlet end 38 of core 16 and a core outlet tank 50 is at outlet end 40 of core 16. Tanks 48,50 each include ~~an aperture or~~ spout 52 provided for extending into aperture 42 of plates 12,12a and also include at least one, and preferably a pair of, second locating members such as protuberances 34 spaced equidistantly from spout 52. Spouts 52 of each core 16,16a,16b lie on a common axis which, in the form illustrated, is the vertical geometric centerline or longitudinal axis of the core. In this manner each core 16,16a,16b is pivotally mounted between plates 12,12a by virtue of spouts 52 being a pivotal axis. Protuberances 34 are of a construction sufficient for engagement with detents 32. As best illustrated in Figures 1 and 6, a pair of protuberances 34 engage a pair of detents 32, one of the protuberances 34 and engaged detents 32 being adjacent upstream side 20 and another of the protuberances 34 and engaged detents 32 being adjacent downstream side 22 for securing any of the cores 16,16a,16b, or

others, in the desired predetermined registration with plates 12,12a. More specifically, detents 32 are located in a predetermined registration so that when engaged by a given pair of protuberances 34 on a given core 16,16a,16b, etc., edge 26 of core 16a, for example, is in flow resisting proximity with adjacent core 16b at upstream side 20 and edge 28 of core 16a is in flow permitting proximity with adjacent core 16 at downstream side 22 forming slot 30. Protuberances 34 can engage either the upstream or downstream detents 32 when core 16 is rotated 180 degrees so that either edge 26,28 is adjacent upstream side 20 or downstream side 22 for exposing either one of the similar opposed faces 68 (only one of which is shown in Figure 1) of core 16.

Means 36, see also Figures 3 and 4, comprises ~~a generally known~~ inlet resilient mounting member 54 and an outlet resilient mounting member 56, each member including a single lip 58 for sealing between aperture 42 and spout 52 and peripheral resilient mounting strip 60. ~~In accordance with this invention,~~ Each member includes resilient locating detent pads 62 formed to accommodate protuberances 34 on one side 64 and to accommodate detents 32 on another side 66. As illustrated in Figure 1, inlet resilient member 54 is between core inlet tank 48 and inlet plate 12, whereas outlet resilient member is between core outlet tank 50 and outlet plate 12a. Apertures 70 are formed through pads 62 to limit air entrapment between detents 32 and protuberances 34.

Industrial Applicability

With the parts assembled as set forth above, hot fluid is introduced into main inlet tank 14 and then flows downwardly through tubes 44 of core 16 and into the main outlet tank 14a. The fluid is cooled in

the core 16 in the usual manner. As the fins 46 on faces 68 of the core 16 which are receiving air flow are erroded or abraded due to sand particles and the like in the air flow it may become necessary to rotate the core 16. One can first remove main tank 14, loosen or remove bolts 15 and partially separate the core 16 from the input plate 12 and the output plate 12a and rotate core 16, in place, 180°. The entire assembly is then positioned back in place. Generally, the resilient means 36 will not be rotated but will be left affixed to the core 16.

The present heat exchanger structure is useful for cooling internal combustion engines such as are used in vehicles and in stationary installations. The possibility of leakage is minimized by providing only a single fluid communication between each core 16, its inlet plate 12 and its outlet plate 12a.

CLAIMS

1. A heat exchanger assembly (10) comprising a pair of frame members (12,12a) each having an aperture (42) therein; and a core (16) extending between the frame members and having opposed end portions (38,40) and a spout (52) extending outwardly from each end portion and into the aperture of a respective one of the frame members; characterised by complementary locating means (32,34) on one of the end portions and on the respective frame member for locating the core in a predetermined registration with the frame members; and resilient means (56) resiliently supporting the core between, and sealing the core to, the frame members; the resilient means including a resilient pad (54,56) positioned between the one end portion and the respective frame member and having a portion (64,66) resiliently interposed between the complementary means.

2. An assembly according to claim 1, wherein the complementary locating means (32,34) are duplicated on opposite sides of the spout on the one end portion and on the respective frame member whereby the core may be located in registration with the frame in two positions between which it is notionally rotated through 180° about the axis of the spout.

3. An assembly according to claim 1 or claim 2, wherein the complementary locating means (32,34) and resilient pad (54,56) are also provided on and between

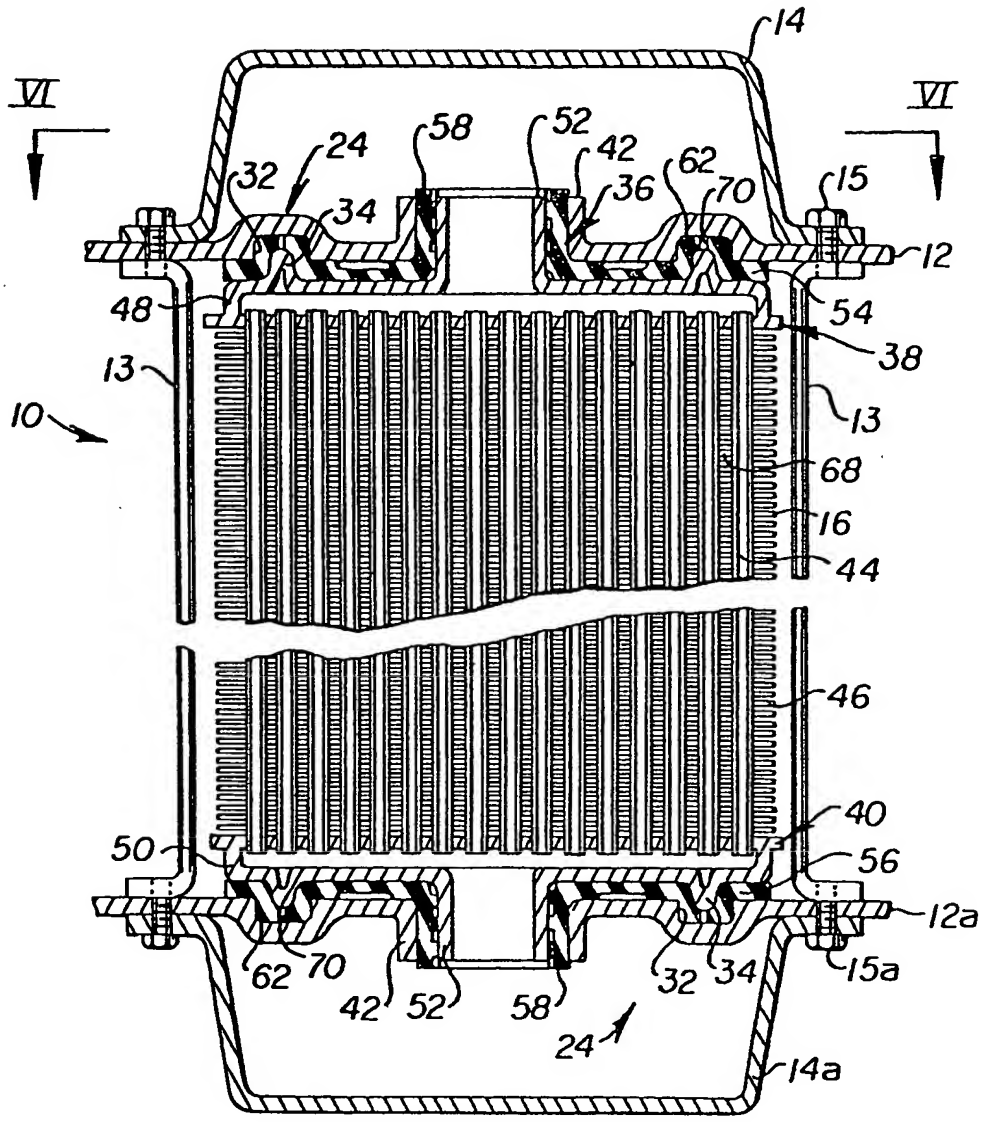
the other end portion (38,40) and the respective frame member (12,12a).

4. An assembly according to any one of the preceding claims, wherein the or each of the complementary locating means comprises a protuberance (34) and a detent (32).

5. An assembly according to claim 4, wherein the protuberance (34) and detent (32) are each imperforate.

6. An assembly according to any one of the preceding claims, including a plurality of the cores (16) extending between the frame members (12,12a), a plurality of the resilient means for resiliently and sealingly supporting the cores between the frame members and a plurality of the complementary locating means for locating the cores in predetermined registration with the frame members.

FIG. 1.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VI
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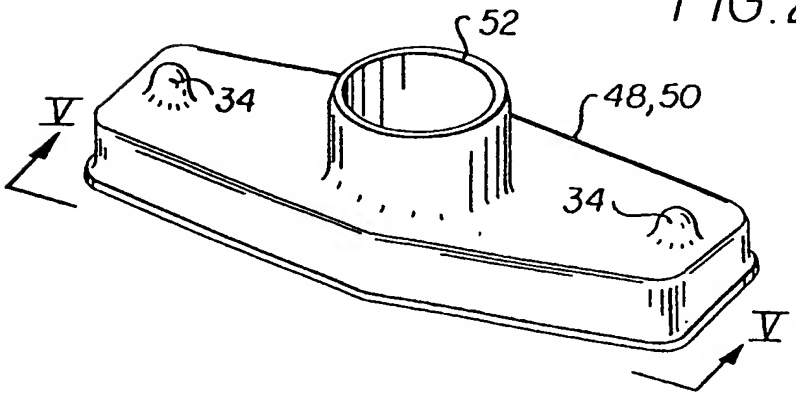
FIG. 2.


52
V
34
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V

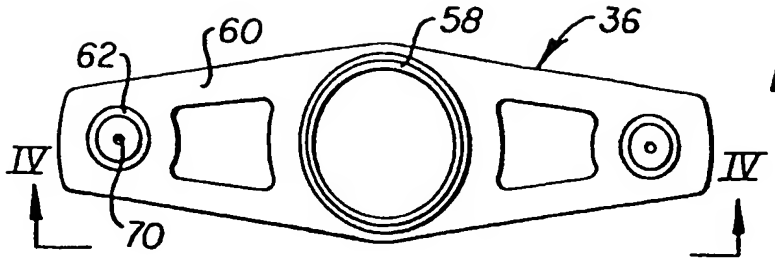


FIG.3.

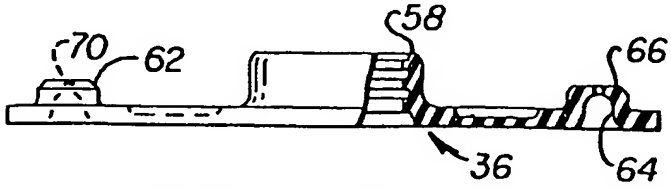


FIG.4.

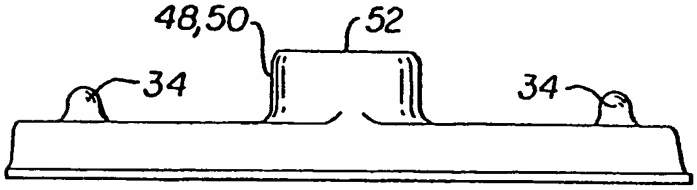
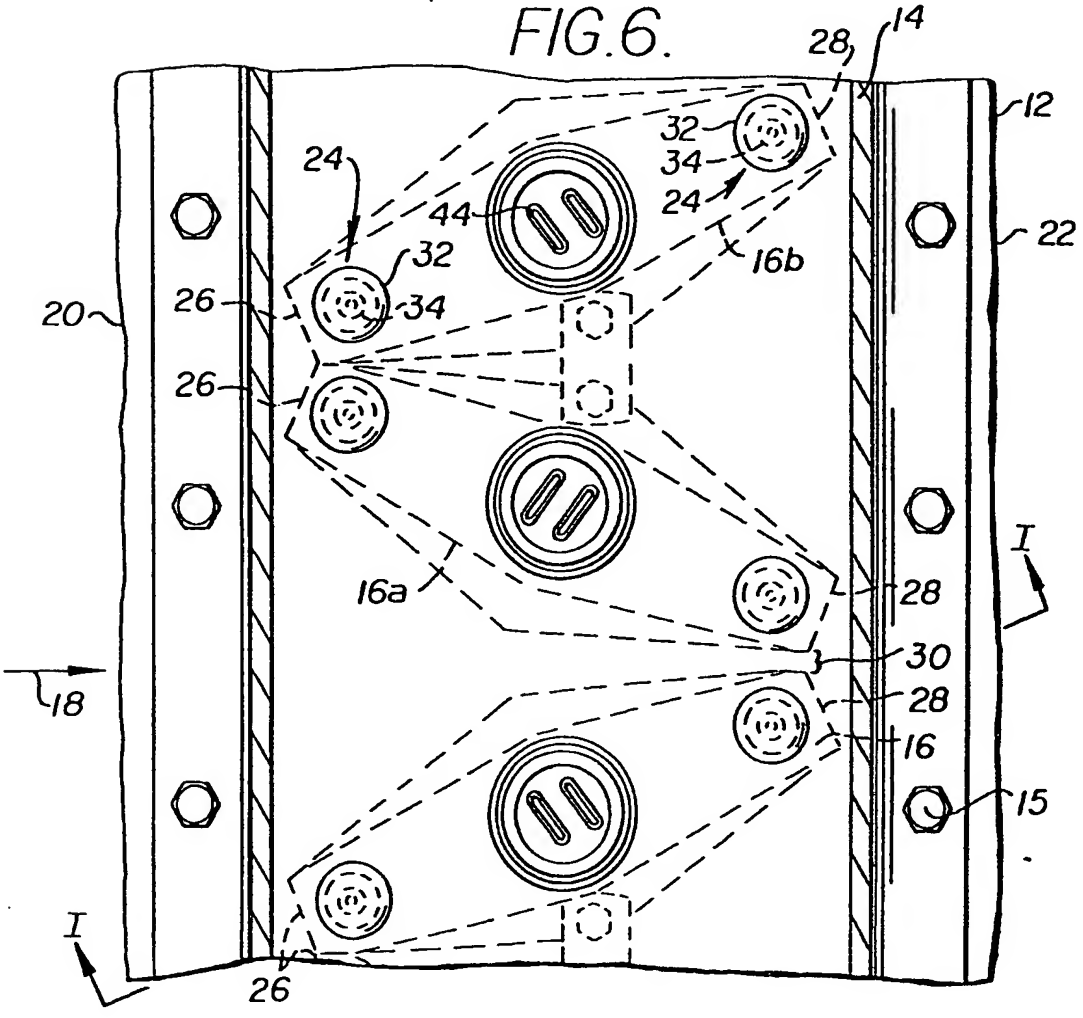


FIG.5.

FIG.6.



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EUROPEAN SEARCH REPORT

Application number EP 80 30 2397

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	GB - A - 464 918 (SEARLE) * Page 2, lines 14-67; figures 1,2,4 *	1-3
	WO - A - 79/00605 (KESKE) * Page 4, line 10 - page 6, line 29; figures 1,2,5,6 *	1,6
	GB - A - 25643/1910 (LAMPLOUGH) * Page 2, line 26 - page 3, line 5; figures 1,2 *	1-3
	FR - A - 1 228 182 (SUPERHEATER) * Page 2, right-hand column, lines 6-11; figures 7,8 *	4,5
A	US - A - 1 409 272 (BEAM)	1
A	FR - A - 2 386 005 (CATERPILLAR)	1
A	FR - A - 588 335 (LAVA)	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

F 28 D 1/02

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

F 28 D
F 28 F

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14-01-1981	JOHANSSON

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